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## SELF-STERILIZING ARTICLE AND ITS PREPARATION

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This invention relates to a method useful in treating cloth and other articles to render them antiseptic and self-sterilizing, and to the antiseptic and self-sterilizing articles so produced.

The treatment of articles, such as those made of fabric, rubber goods, paper, leather, felt, synthetic organic plastics, ceramics and other substances to render them lethal over prolonged periods of time and use to microorganisms coming into contact with them has long presented a problem for which no ready or simple solution has heretofore been found. Methods have been devised for impregnating fibrous and, in some instances, non-fibrous articles with solutions or suspensions of germicides or fungicides to give them a measure of self-sterilization until used. A number of conventional germicides and fungicides have been used for such purposes. Bandages supporting germicides on the fibers and in the interstices between the fibers have been prepared which could be stored in the open air without becoming unduly contaminated with microorganisms and which could subsequently be applied to open wounds without danger of carrying air-borne infections into the wound. Although this procedure has met with some success, the practice has not been entirely satisfactory for a number of reasons and has not been used on a wide scale, the usual practice in the case of bandages which are to be stored prior to use being to package the sterilized bandage under aseptic conditions in a germ-proof package, or to sterilize the bandage, e. g. by heat, after it is packaged.

Most of the attempts heretofore made to render fabrics self-sterilizing have been confined to the treatment of bandages and surgical gauze because of the particular necessity for keeping them in a sterile condition until used. Such articles are generally used only once and then discarded so that the question of permanence of the treatment during repeated use and laundering of the article does not generally arise. There are, however, many other instances where the need is apparent for an antiseptic and self-sterilizing cloth or other article which will retain these properties after continued and repeated use and laundering. Thus, clothing, underwear, bedding, stockings, paper, leather goods, towels, shoe linings, diaper cloth, rubber goods, bristles, plastic articles designed for body contact and many other articles invariably carry many kinds of bacteria on their surfaces after even brief exposure to the air and may become potent sources of infection when worn or otherwise contacted with the skin. Bacteria already present on the skin may be picked

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up by clothing and transported to abraded areas with the consequent development of infection in such areas. Frequent laundering or cleaning of such articles serves to clean and sterilize them temporarily but such sterilization has no lasting effect and the articles are subject to re-contamination immediately after laundering.

The need is apparent for a method for treating articles, including those mentioned as well as many others, to impart to them highly effective antiseptic and self-sterilizing properties which are not unduly affected or destroyed by laundering or cleaning or by normal use, and which would thus be effective over a long period of time in devitalizing microorganisms coming in contact therewith. It is likewise apparent that not only would the method itself be of great value, but that the self-sterilizing article itself would be equally valuable provided its self-sterilizing property were sufficiently permanent.

It has now been found, and is herein first disclosed, that an unexpectedly high degree of self-sterilization of a substantially permanent nature for all practical purposes can be imparted to many fibrous and non-fibrous articles by co-precipitating, under controlled conditions hereinafter described, on the surface of or in the interstices of, or even within the body of, the article a mixture of at least two water-insoluble salts or compounds, one of which is a water-insoluble silver compound. The treated article can be stored or used without substantial noticeable alteration in its physical characteristics as compared with the untreated article. Articles treated according to the method can be laundered or cleaned repeatedly, generally with not more than a slight diminution of their antiseptic and self-sterilizing properties. Hypochlorite and chlorine bleaching of laundered treated articles can be effected without harm and actually appears to restore any decreased germicidal activity which may have been caused by repeated laundering under adverse conditions.

An essential feature of the process is the presence in the precipitating bath of a compound or substance, herein referred to as a "solubilizer," which has at least a partial solubilizing effect on the water-insoluble silver compound to the extent that it renders the silver compound more soluble in the bath than in pure water. Solubilizers which can be used include ammonia and organic amines as well as certain inorganic salts. Depending upon its nature, the solubilizer is eventually removed from the article by evaporation or leaching with water, or sometimes by neutraliza-